6G wireless connectivity
Something new or more of the same?

1G	2G	3G	4G	5G	6G
~1980	~1990	~2000	~2010	~2020	~2030
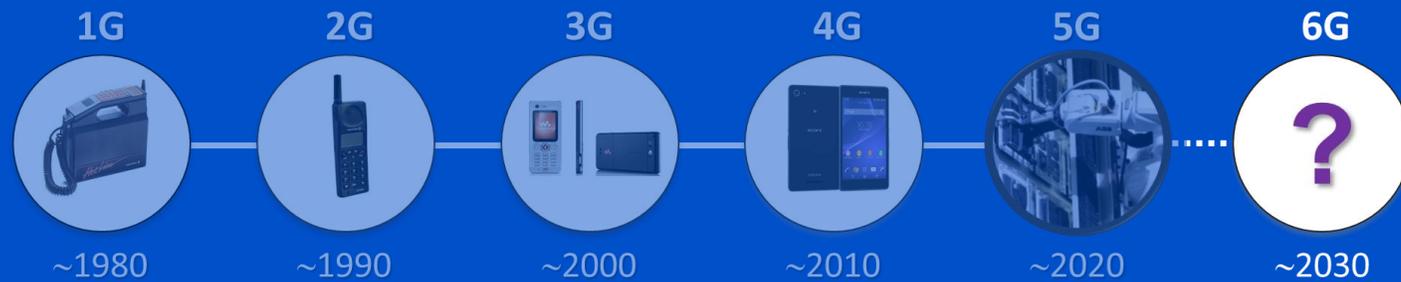
Erik Dahlman

Ericsson

Future wireless access — What do we need?

What do we not need?

- Higher peak data rates
- Lower minimum latency?

What do we need?

- Higher achievable data rates
- Higher network capacity
- Reliability, availability, resilience, …
- Improved energy performance
- Lower cost
- …

Especially for the uplink
(uplink coverage)

What is a "New Generation"?

What characterizes a new generation?

- A big leap in technology?

- A big leap in capabilities?

- New spectrum?

- No need for backwards compatibility?

- New set of 3GPP specifications!

A new generation gives a fresh start

- New features actually being implemented
  ⇨ *More capable in practice*

- Possibility to remove features
  ⇨ *Reduced complexity and cost*

- Restart of evolution cycle
  ⇨ *Much more capable in the long run*

6G is critical to ensure the long-term evolution of wireless connectivity

6G wireless access

Technology-wise 6G wireless access will inherit much from 5G

Keep
aspects of 5G that work well

Change/update
when motivated

Add
functionality for new use cases

6G wireless access
Some key technology components
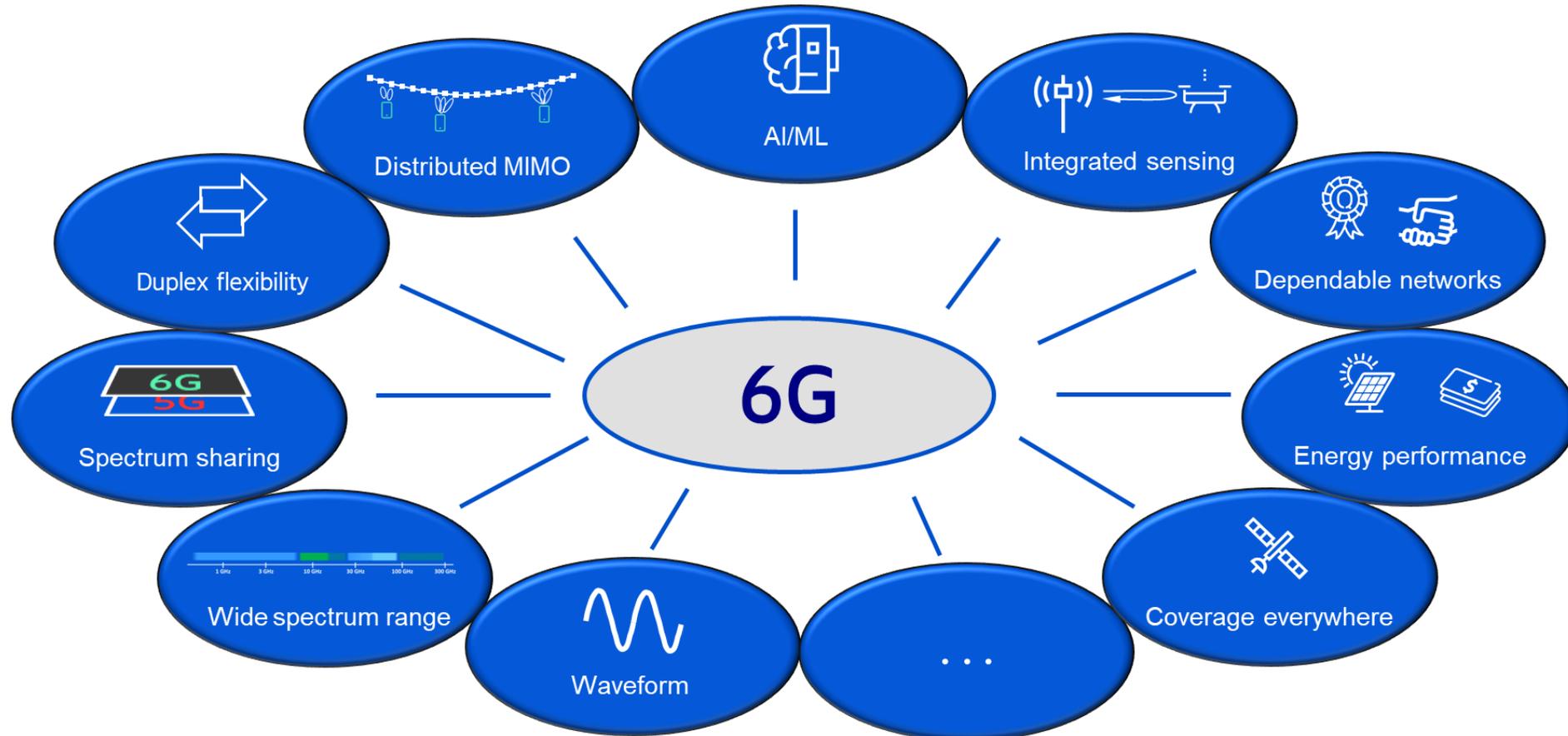
Spectrum for 6G

Current 4G/5G spectrum
- Below 7 GHz
- mmw

New 6G spectrum
- cm-wave
- Sub-THz?
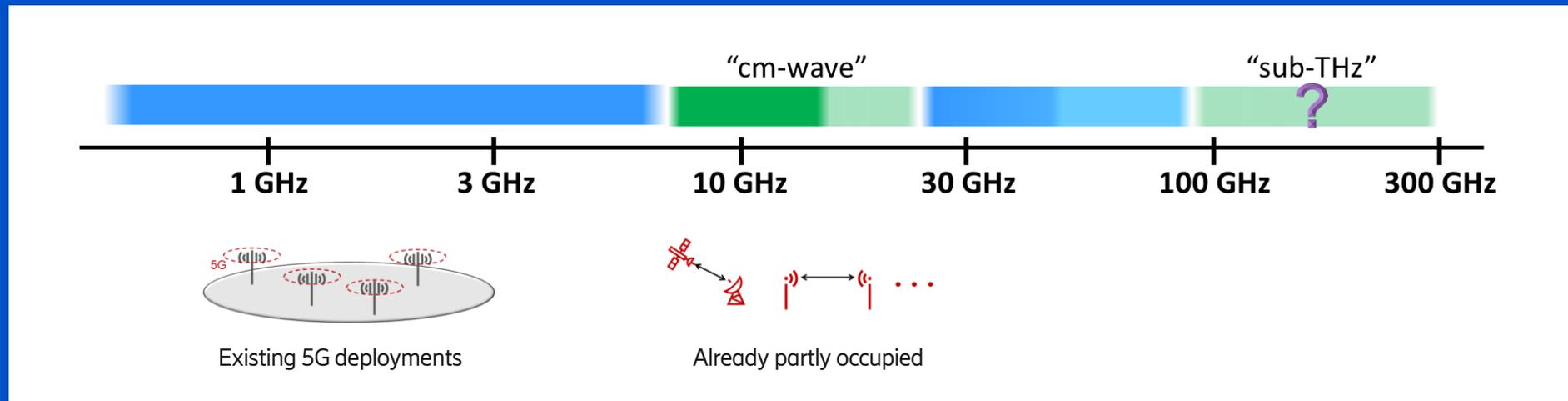
Spectrum sharing
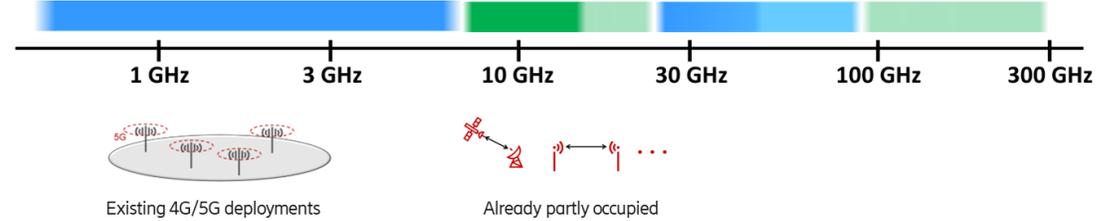
5G/6G spectrum sharing

Allow for 6G to be deployed on top of 5G
⇨ *Smooth introduction of 6G in existing spectrum*
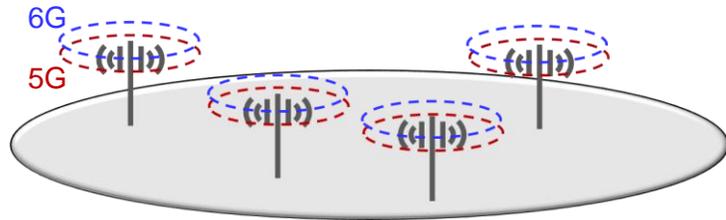
Requires a 5G-compatible 6G waveform

*Efficient spectrum sharing
enabled by 5G "lean design"*

Co-existence with other usages

Enable 6G deployment on top of other technologies
⇨ *Smooth access to new spectrum*
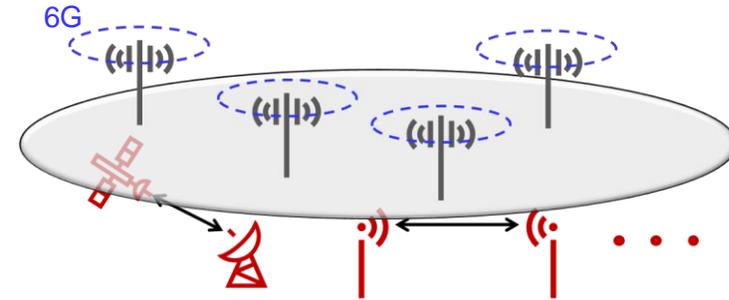
AI for communication — where, when and how?

High-dimensional problems for which

- there is no good model

- deriving the "optimal" solution is difficult/impossible

Some examples
- Beam management
- Scheduling
- Mobility
- Network deployment
- ....

→ Improved efficiency
Reduced cost

One-sided model

Relatively straightforward
Limited standardization

Two-sided model

Inter-operability?
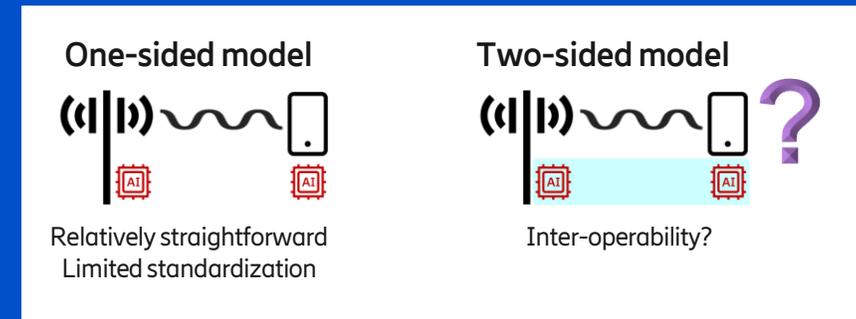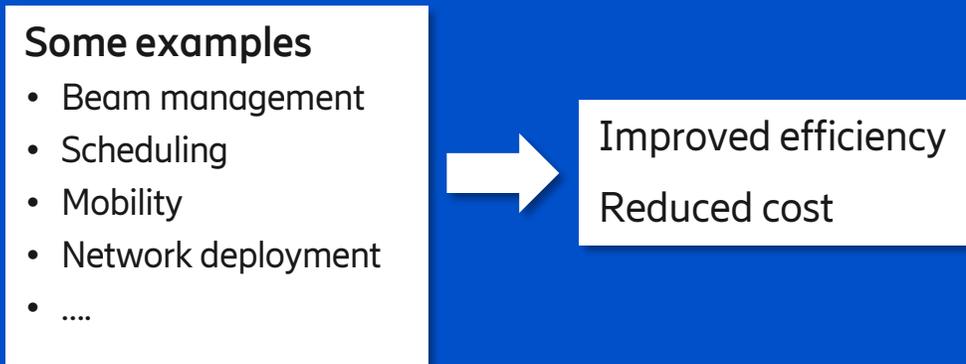
Mainly implementation with limited specification impact

At least in the short/medium term

Integrated communication and sensing
a.k.a. "Situational awareness"

Sensing: Detect the presence/location/movement of passive objects

ICAS: Sensing as an integrated part of the communication network
- Reuse of communication resources (infra-structure, spectrum, devices) for sensing

⬇

Introduction of sensing functionality with low incremental cost

Enable new/enhanced services

Enhance the network performance

Mission-critical connectivity and dependable networks

A high-performance network that one can truly trust and depend on

Public networks
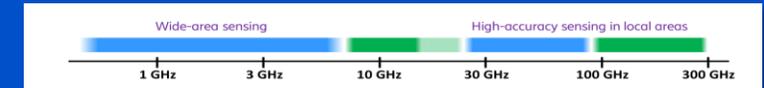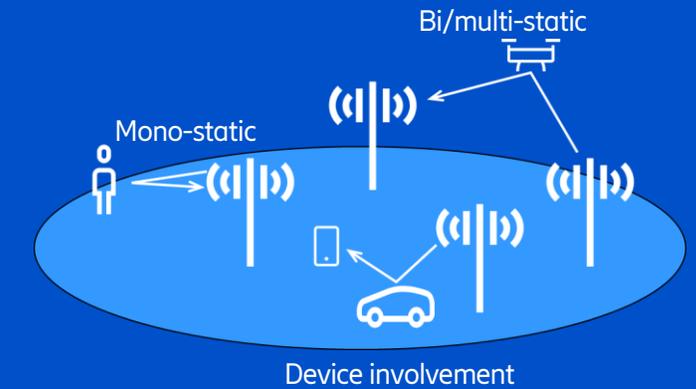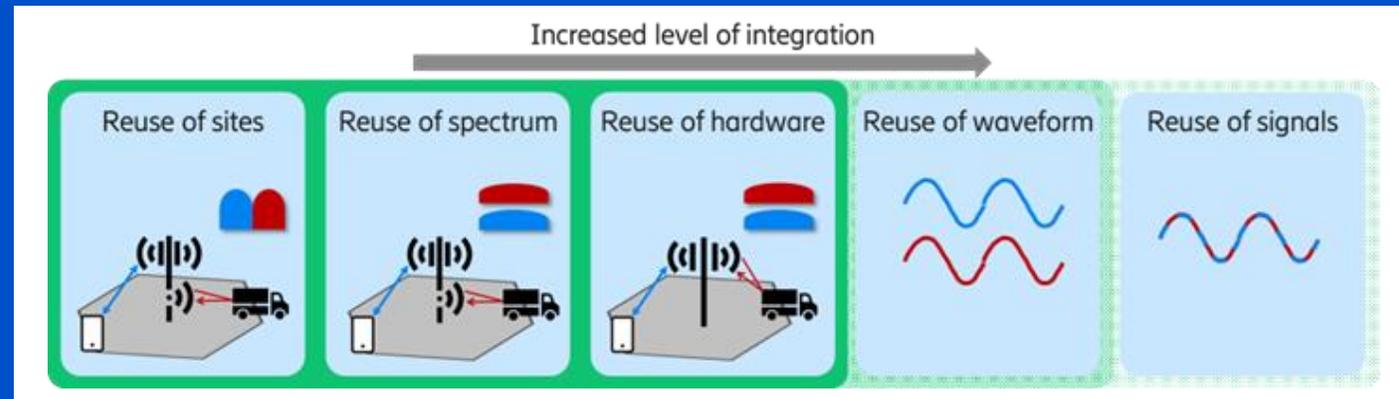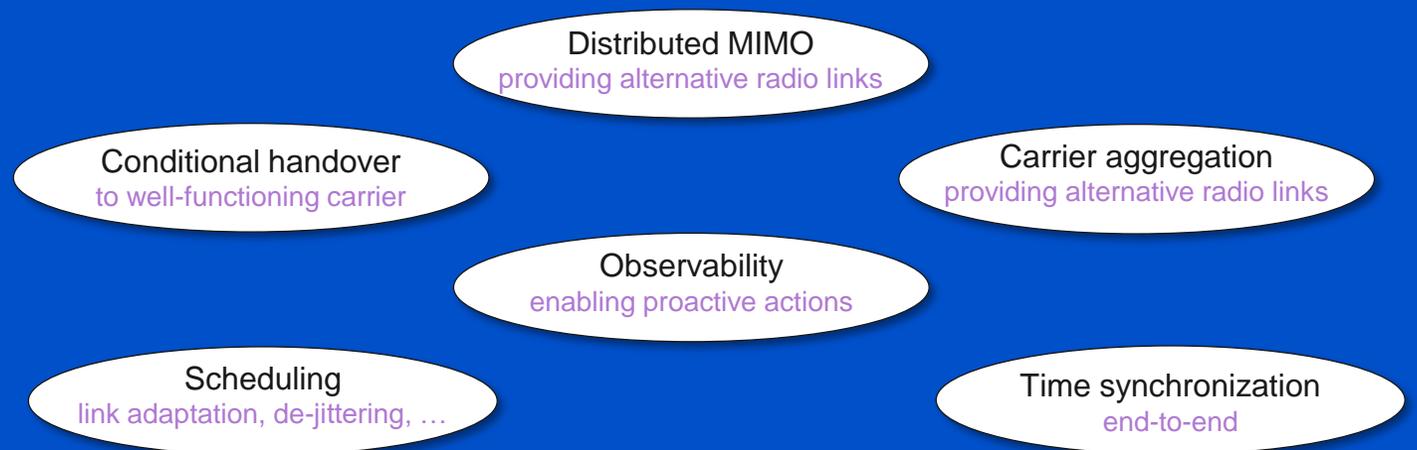- Highly automated vehicles
- Professional video production
- Managed IT devices
- …

Dedicated networks
- Manufacturing
- Mining
- Oil and gas
- Connected workers
- …

- High service availability from efficient and cost-effective redundancy to minimize the impact of failures

- Time-critical services, "the right packet at the right time"

- …

Distributed MIMO
providing alternative radio links

Conditional handover
to well-functioning carrier

Carrier aggregation
providing alternative radio links

Observability
enabling proactive actions

Scheduling
link adaptation, de-jittering, …

Time synchronization
end-to-end

Summary

6G will inherit much from 5G

- Keep what is good!
- Update if motivated!
- Add if needed!

6G will further extend the capabilities of wireless access

- Dependable communication
- Situational awareness
- …

6G is critical to ensure the long-term evolution of wireless connectivity

Thank you!